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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/773,733

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Kyung-Ho Yoon

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BACHMAN & LAPOINTE, P.C.  
900 CHAPEL STREET  
SUITE 1201  
NEW HAVEN, CT 06510

EXAMINER

MONDT, JOHANNES P

ART UNIT

PAPER NUMBER

3663

DATE MAILED: 09/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/773,733	<b>Applicant(s)</b> YOON ET AL	
	<b>Examiner</b> Johannes P. Mondt	<b>Art Unit</b> 3663	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 23 June 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Response to Amendment*

Amendment filed 6/23/06 forms the basis for this office action. In said Amendment applicant amended the Drawings, in particular Figures 1, 2A, 2B, 3A and 3B. Comments on Remarks submitted with said Amendment are provided below under "Response to Arguments".

### *Drawings*

With regard to the amendment to the Drawings, in particular Figures 1, 2A, 2B, 3A and 3B, said Amendment has been approved, the required Prior Art labels having been added. See, however, under "Response to Arguments" for comments on the traverse to enter Replacement Sheets filed 10/24/05.

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. **Claim 1** is rejected under 35 U.S.C. 102(b) as being anticipated by Oh et al (6,393,087 B1) (previously cited).

*Oh et al teach* (title, abstract, Figures 1-3 and cols. 1, 2, 5, 6, 7, 8 and 9) a spacer grid 2 (col. 5, l. 55-63) for placing and supporting a plurality of longitudinal fuel rods 106 (col. 1, l. 19) in a nuclear reactor fuel assembly (first sentence of the abstract), comprising

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a plurality of inner strips 113 (col. 1, l. 26-28) intersecting each other to form a plurality of guide tube cells 108 (col. 1, l. 30-31) to receive guide tubes 103 (col. 1, l. 18-19) therein (see Figure 1) and

a plurality of fuel rod cells 8 or 108 (col. 1, l. 29-30 and col., col. 6, l. 22) to receive the fuel rods 6 or 106 (col. 1, l. 35-36 and col. 6, l. 44-46) therein, with a plurality of mixing blades 32 (col. 7, l. 1-14) projecting upward from the inner strips at intersections of the inner strips (Figures 5-6, 8 and 9); and

a plurality of perimeter strips (outer strips 113; loc.cit.) each of which comprises a plurality of cell walls including intermediate cell walls and corner cell walls (necessarily so, as all intermediate strips are included in their interior), the perimeter strips (as the outer strips necessarily) encircling the intersecting inner strips and the corner cell walls forming outermost corner cells of the spacer grid (because they are cells at the corners),

with a grid spring 12/13/14 (col. 6, l. 7-10) provided on each of the cell walls, the grid spring comprising (see Figures 5 and 6):

a vertical opening 13 or 14 (col. 6, l. 7-10) formed at a central area of each of the cell walls;

a vertical support part (un-numbered trapezoid shaped end portions abutting said vertical opening on both bottom and top sides thereof) extending vertically in the vertical opening between top and bottom edges of the vertical opening (any structure abutting an opening can be said to extend in said opening); and

a fuel rod support part 12 (col. 6, l. 7-10) provided at a central portion of the vertical support part (namely: in between said vertical support part top and bottom portions), the fuel support part being bent (col. 6, l. 42-44) and thereby having the capability of providing a conformal support surface conformal to a fuel rod supported by the grid spring.

In conclusion, Oh et al anticipate claim 1.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. ***Claims 1-2*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Delafosse et al (4,224,107) (made of record previously) in view of Chun et al (6,236,702 B1) (made of record by applicant, see IDS).

*Delafosse et al* teach a spacer grid 1 (col. 2, l. 49-51) capable of being used for placing and supporting a plurality of longitudinal fuel rods (fuel pins not shown; see col. 2, l. 48-64) in a nuclear reactor fuel assembly (title, col. 1, l. 5 – col. 2, l. 64), comprising a plurality of inner strips 2 and 3 intersecting each other and forming a plurality of cells A (Figure 8 and col. 2, l. 48-64) *capable* to receive guide tubes and fuel rods therein, with a plurality of mixing blades (Figures 8-9; see elevated, protruding portions of 2 and 3) projecting upward from the inner strips 2 and 3 at intersections of the inner strips; and

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a plurality of perimeter strips 2a and 3a ((Figure 8 and col. 2, l. 48-64) each comprising a plurality of cell walls including intermediate cell walls and corner cell walls (intermediate cell wall is shown separated from corner cell wall by 20 in Figure 8), the perimeter strips encircling the intersecting inner strips 2a and 3a encircling the intersecting inner strips 2 and 3 and the corner cell walls forming outermost corner cells of spacer grid 1 with a grid spring 5 (col. 3, l. 22-55 and Figures 4-6 and 8-9), the grid spring comprising:

- a vertical opening (opening in 2a or 3a; Figures 8-9) formed at a central area of each of the cell walls;

- a vertical support part 14 extending vertically in the vertical opening between central portions of top and bottom edges of the vertical opening (col. 4, l. 1-28 and Figure 5);
- and a fuel rod support part 6 (col. 2, l. 64 – col. 3, l. 11) provided at a central portion of the vertical support part (Figure 5).

*Delafosse et al do not necessarily teach the limitation “the fuel rod support part being bent to have a conformal support surface which is conformal to a fuel rod supported by the grid spring”.*

*However, it would have been obvious to include said limitation in view of Chun et al, who, in a patent on a spacer grid for a fuel assembly (title, abstract), hence analogous art, teach the spring (30) to have a curved contact portion (31) so as to be in conformal contact with a circumferential surface of the fuel element (11) for the specific purpose of enhancing vibration suppressing and abrasion resistance forces (see abstract, Figures 3, 8 and col. 5, l. 1 – col. 6, l. 3). Motivation to include the teaching by Chun et al in the*

invention by Delafosse et al derives from the teaching by Chun et al of enhanced vibration suppressing and abrasion resistance forces (abstract, final sentence).

*On claim 2:* in the combined invention by Delafosse et al and Chun et al defined above, the vertical support part 14 is bent at two steps along substantially horizontal bending lines (due to the corrugated nature of the corrugated strips 5 in Delafosse et al; see Figures 3-6 and abstract; col. 2, l. 64 – col. 3, l. 11), and the fuel rod support part 6 is bent in such a way as to be conformal with the fuel rods 11 (see Chun et al, Figures 3 and 8, and col. 5, l. 1 – col. 6, l. 3). The claimed “uniform contact pressure distribution when the fuel rod support part is in contact with each of the fuel rods” is an inherent consequence of the conformal contact between 6 and 11 because contact conditions are invariant along the line of contact, the outer surface of 6 following the periphery of fuel rods 11.

3. **Claims 3-4** are rejected under 35 U.S.C. 103(a) as being unpatentable over Oh et al (as applied to claim 1 above) in view of De Mario et al (5,303,276) (previously made of record).

*On claim 3:* As detailed above, Oh et al anticipate claim 1. Further according to Oh et al, each of the intermediate cell walls has a coolant flow guide vane 30 (i.e., longer one of two structures 30 shown in the upper portion of Figure 9) and a guide tap (shorter one of two structures 30 shown in an upper portion of Figure 9) on an upper edge thereof (col. 7, l. 1-14 and Figure 9) such that a plurality of coolant flow guide vanes and a plurality of guide taps are alternately arranged (col. 7, l. 33-39) along an upper edge of each of the intermediate cell walls (loc.cit. and Figure 14 and col. 7, l. 15-

24)., Oh et al do not necessarily teach the further limitation that "each of the corner cell walls having either a coolant flow guide vane or guide tap on an upper edge thereof to complete an alternate arrangement of the coolant flow guide vanes and guide taps".

*However, it would have been obvious to include said further limitation in view of De Mario et al, who teach upper and lower edges of the perimeter strips, and hence also of corner cell walls to have guide/protective/flow taps or vanes of different geometric dimensions bent inwardly in an alternating arrangement (Figure 3 in De Mario et al; see vanes over 320 and col. 8, l. 16-28), incorporation of the teaching in this regard by Mario et al thus completing an alternate arrangement of coolant flow guide vanes and guide taps in cooperation with the intermediate cell walls. Motivation to include the teaching by Mario et al in the invention by Oh et al derives immediately from the noted advantage by De Mario et al that the inventive arrangement by De Mario et al succeeds in providing single-phase coolant flow distributed over each fuel rod even at high heat flux (col. 5, l. 19-24).*

*On claim 4: Furthermore, although Oh et al do not necessarily teach the further limitation as defined by claim 4 it would have been obvious to include said further limitation in view of De Mario et al, who teach each of the intermediate cells walls to have downwardly projecting guide taps (downward protrusions thereof as shown in Figure 3) at both corners (i.e., at both the left and right corner adjacent lattice members 310 of each intermediate cell walls and each of the plurality of corner cell walls has a guide tap projecting downward on a lower edge of each of the corner cell walls (see element 330 in Figure 3 of De Mario and col. 8, l. 28-34). Motivation to include the*



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teaching by Mario et al in the invention by Oh et al derives immediately from the noted advantage by De Mario et al that the inventive arrangement by De Mario et al succeeds in providing single-phase coolant flow distributed over each fuel rod even at high heat flux (col. 5, l. 19-24).

4. **Claim 5** is rejected under 35 U.S.C. 103(a) as being unpatentable over Oh et al and De Mario et al as applied to claim 3 above, and further in view of Delafosse et al (4,224,107) (previously made of record).

As detailed above, claim 3 is unpatentable over Oh et al in view of De Mario et al. Furthermore, each of the coolant (flow guide) vanes in Oh et al is bent toward a center of the spacer grid because each of said coolant vanes is shown, – and in order to cause a swirl of the coolant fluid: must be, bent in two orthogonal directions so as to cause a swirl, i.e., a rotation of the fluid (see Figures 8 and 9 and col. 7, l. 1-68). Said two directions span a plane. The vector connecting each coolant flow guide vane with a center of said spacer grid toward a center of the spacer grid (as opposed to *the* center of said spacer grid (the latter may not even exist, in the case when the number of cells in either a row or a column is even), as any center of any element qualifies to be a center of said spacer grid). Furthermore, it is noted that Oh et al teach elements 30 to be “bent towards the center of the main flow path” (col. 7, l. 1-14), which center, when said flow path is taken as a whole, is substantially identical to the center in a horizontal cross section of the spacer grid. Oh et al also show a width of each of said guide vanes reducing from a position at which each of said guide vanes is initially bent (see Figure 6), showing a tapered shape (loc.cit.).

*Oh et al do not necessarily teach the further limitation that a peak of each of the guide vanes to be rounded. However, they do indicate that its specific shape is a matter of design choice because said shape can be chosen "in accordance with a desired swirl flow" (col. 7, l. 44-49). Furthermore, it would have been obvious to include said further limitation in view of Delafosse et al, who teach the rounding of protrusions 9 over cell walls 2 and 3 (hence structurally analogous to protrusions 30 of Oh et al), where the rounding is to as to avoid jamming (col. 3, l. 12-20). Motivation to include the teaching by Delafosse et al immediately derives from the advantage of the avoidance of jamming.*

5. **Claim 6** is rejected under 35 U.S.C. 103(a) as being unpatentable over Oh et al and DeMario et al as applied to claim 3 above, and further in view of Nguyen et al (6,526,116 B1) (previously made of record).

*As detailed above, claim 3 is unpatentable over Oh et al and DeMario et al. Although Oh et al nor DeMario et al necessarily teach the further limitation defined by claim 6, it would have been obvious to include said further limitation in view of Nguyen et al, who, in a patent on nuclear fuel assemblies with spacer grid ("support grid", see abstract, first sentence) and mixing vanes (loc.cit.), hence analogous art, teach each guide tap 32 to be bent in two lateral directions orthogonal to each other, hence also in the direction towards the center of the spacer grid (col. 5, l. 10-43, and Figures 1 and 2). Motivation to include the teaching by Nguyen et al in the invention by Oh et al and DeMario et al derives from the resultant balance of hydraulic forces across the center of the grid (see abstract).*

6. **Claims 7-8** are rejected under 35 U.S.C. 103(a) as being unpatentable over Oh et al as applied to claim 1, in view of Mayet et al (6,542,567 B1) (previously made of record) and Foulds (3,966,550); or, in the alternative, over Delafosse et al and Chun et al as applied to claim 1, and further in view of Mayet et al (6,542,567 B1) and Foulds (3,966,550).

As detailed above, Oh et al anticipates claim 1 and claim 1 is unpatentable over Delafosse et al in view of Chun et al. It is furthermore noted that Delafosse et al disclose inner springs 5 for those compartments A that are inner compartments (Delafosse et al, col. 2, l. 64-col. 3, l. 11), and that furthermore, Oh et al disclose contact springs 12 for each of the grid elements 11 (col. 6, l. 37-55).

Neither Oh et al nor Delafosse et al and Chun et al necessarily teach the further limitations as defined by claims 7-8.

However, it would have been obvious to include said further limitations in view of (a) Mayet et al, who teach to use Zircaloy for the material embodiment of the straps including springs in those regions with the higher neutron flux (col. 1, l. 23-27) (examiner takes official notice that Zircaloy excels through low neutron cross section, whence the preference for Zircaloy under high neutron flux; see also DeMario (loc.cit.), col. 7, l. 10-16), while on the other hand it is known that the mechanical strength of Zircaloy diminishes rapidly due to neutron irradiation (see Mayet et al, loc.cit.) thus making it less preferable in the edge region where neutron flux is lower than in the center of the spacer grid; it would hence have been obvious to use a viable alternative for Zircaloy in the edge region, such as steel in view of

(b) Foulds (col. 9, l. 61- col. 10, l. 8) for which the recommended spring constant exceeds that for Zircaloy (Foulds et al, loc.cit.).

*Motivation* to include the teaching by Mayet et al and Foulds et al in the invention by Oh et al or the invention by Delafosse et al and Chun et al derives from the advantage to reduce neutron loss by using Zircaloy while preventing mechanical deterioration of the springs where an alternative such as steel is acceptable because of reduced neutron flux.

### ***Response to Arguments***

Applicant's arguments filed 6/23/06 have been fully considered but they are not persuasive. In particular:

(a) With regard to the traverse of the rejection under 35 U.S.C. 102(b), counter to applicant's argument on page 11 of Remarks that while claim 1 "calls for the fuel rod support part to be bent to have a conformal support surface which is conformal to the fuel rod supported by the grid spring" (with which the examiner agrees), a "review of the structure of Figures 5 and 6 of Oh et al, which were refereed to [interpreted by examiner as "referenced to"] by the Examiner, shows structure which is clearly not conformal with the rod", with which statement the examiner respectfully disagrees: although the Drawings, i.e., Figures 5-6 do not show a conformal support surface *along the entire surface* of the fuel rod, the written description of Oh et al is quite explicit about element 12 identified as the claimed fuel support part in the office action to be a spring 12 *elastically supporting fuel rod 6 at the bulged portion as a consequence of being bent* toward the center of the grid element 11. See col. 6, l. 42-44 for the disclosure of the

spring 12 being bent and see col. 6, l. 44-46 for the logical consequence thereof. As for support by Figures in Oh et al fuel rod 6 is shown with substantial circular cross section and with a contiguous portion of its circumference in cross sectional view abutted by elastic medium 12. Said fuel rod support part 12 is thus seen to have a surface conformal the fuel rod 6 that supports fuel rod 6. Thereby the claim limitation "the fuel rod support part being bent to have a conformal support surface which is conformal to a fuel rod supported by the grid spring" is met. Therefore, applicant's argument fails to persuade.

(b) With regard to the traverse of the rejection of claim 2 under 35 U.S.C. 102(b), applicant traverse based on the traverse of the rejection of independent claim 1, which is not persuasive for the reasons explained above under (a). Applicant further traverses because Figure .8 "does not show any relevant structure". However, cross-sectional view provided by Figure 8 shows how vertical support part (without numeral as pointed out in the action, but abutting 12 from above and from below) are bent in accordance and therefore is relevant to the claim. However, said bending is not necessarily along a substantially horizontal line. Therefore, the traverse is at least in part persuasive and the rejection is withdrawn and replaced by a new rejection under 35 U.S.C. 103(a).

(c) With regard to the amendment to the Drawings, in particular Figures 1, 2A, 2B, 3A and 3B, said Amendment has been approved, the required Prior Art labels having been added.

(d) With regard to the traverse of examiner's refusal to enter new drawings filed 10/24/05, applicant removed all reference numerals 41 except in Figure 7B. This means

that only the internal structure of unit corner strips, not their topographic coordinates are illustrated. Furthermore, the new drawings are relatively dark, with a consequent diminished contrast between neighboring features. Furthermore, newly introduced numerals 40', 40" now are defined as pointing to "cell walls", whereas before they were used in the specification as pointers to unit (intermediate or corner) strips.

(e) Applicant's traverse of the refusal to enter the amendments filed 10/24/05 to the specification is based in part on the allegation that Figure 5B is identical to the originally filed Drawing of Figure 5B; however, this argument is not persuasive because the original Drawing of Figure 5B had numeral 41, the Figure 5B as newly filed on 10/24/05 does not. Does this mean that the object pointed to by numeral 41 is not what it was before? New matter is introduced in the Drawings through the amendment to the specification discussed next.

(f) The amendment to the specification renames adjectives and nouns, in particular "equiangular" is replaced by "conformal", and "unit strip" is replaced by "cell wall". However, "equiangular" means "having all *or corresponding* angles equal" (see Merriam-Webster's Collegiate Dictionary, page 392), while "conformal", means "having the same shape" (Merriam-Webster's Collegiate Dictionary, page 242); however, when applied to a region, as opposed to a surface, for having the same shape all angles must be equal. In the event of angles that do not correspond they do not have to be equal according to the meaning of "equiangular", but they have to be according to the meaning of "conformal". Furthermore, a "strip" is a "long narrow piece of material" (Merriam-Webster's Collegiate Dictionary, page 1166), not just a wall thereof. Said

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amendment thus comprises an unwarranted narrowing and broadening, respectively. By inference, numerals in the amended Drawings used to point to unit strips, whether (intermediate or corner strips) now only point to cell walls with a resultant difference in the disclosure of the invention. Again, while applicant refers to the Interview Summary of 6/7/05, examiner cannot find any evidence or indication in said Interview Summary that the above replacement of equiangular by conformal and unit strips by cell walls were requested by the former examiner.

(g) Applicant's traverse of the rejection under 35 U.S.C. 112, first paragraph, of claims 1-8, 7-8 and 3-5 are persuasive in light of applicant's comments in traverse.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: Yokoyama (4,885,127) (see Figures 4 and 5 with regard to claim 2).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P. Mondt whose telephone number is 571-272-1919. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack W. Keith can be reached on 571-272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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JPM

September 2, 2006

Patent Examiner:

A handwritten signature in black ink, appearing to read 'J. Mondt', with a horizontal line drawn through it.

Johannes Mondt (Art Unit: 3663)